	Centre Number	Candidate Number
Candidate Name ______________________		

International General Certificate of Secondary Education

UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE

PHYSICS **0625/3**

PAPER 3

Tuesday **14 NOVEMBER 2000** Morning 1 hour 15 minutes

Candidates answer on the question paper.
Additional materials:
Electronic calculator and/or Mathematical tables
Protractor
Ruler (30 cm)

TIME 1 hour 15 minutes

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.

FOR EXAMINER'S USE	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
TOTAL	

This question paper consists of 14 printed pages and 2 blank pages.

(NH) QK07575/2

1 Fig. 1.1 shows a 0.5 kg mass hanging freely on a length of steel wire.

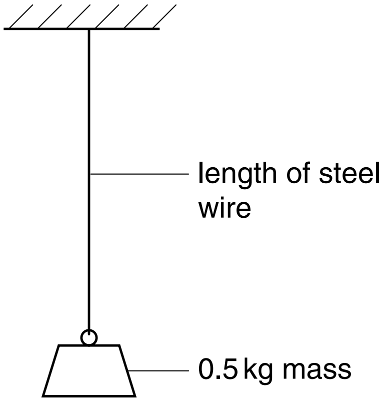

Fig. 1.1

(a) On Fig. 1.1 use labelled arrows to indicate the direction and line of action of each of the two forces acting on the 0.5 kg mass.

The acceleration of free fall is 10 m/s^2. Calculate the values of the two forces which you have indicated.

first force = ... second force = ... [4]

(b) Suggest what causes the two forces to act on the mass.

....

....

....[2]

(c) The 0.5 kg mass is increased by steps of 0.5 kg up to 10 kg. The corresponding extensions of the steel wire are measured. When the mass on the wire is 10 kg, the wire snaps. Fig. 1.2 shows part of the graph of extension against load for the wire.

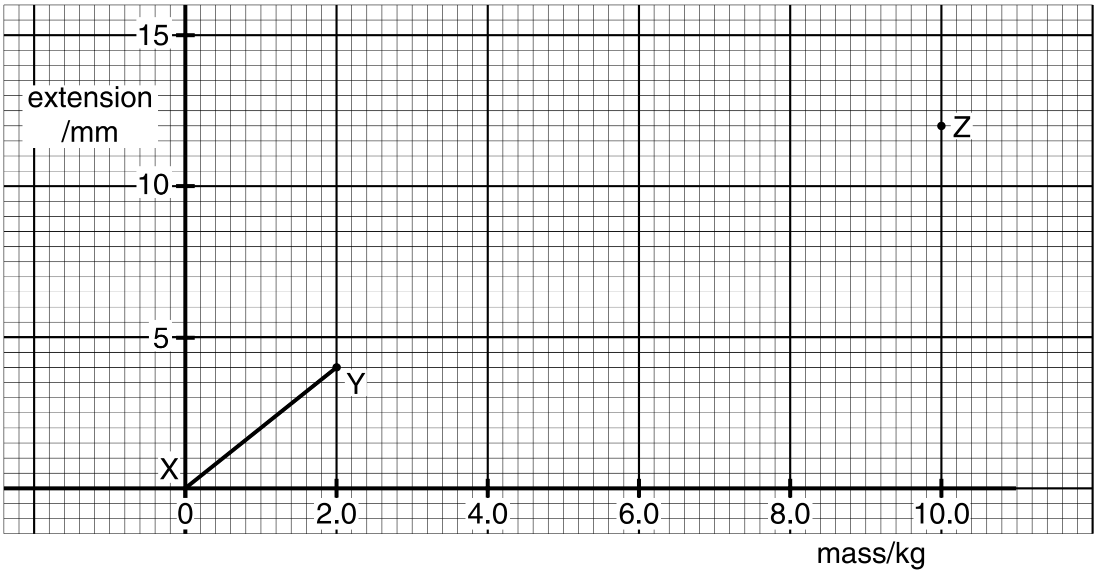

Fig. 1.2

(i) On Fig. 1.2, sketch a possible graph line between Y and Z.

(ii) Determine the mass needed to produce an extension of 3 mm.

mass = ...

(iii) Determine the extension of the wire just before it snaps.

extension = ...

[4]

2 Fig. 2.1 shows a student's design for a thermometer. The student stated that the material labelled M could be a copper rod, alcohol or nitrogen gas.

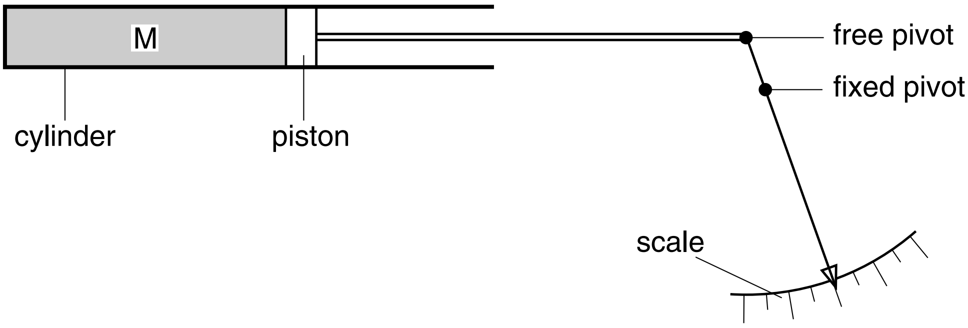

Fig. 2.1

(a) Explain what is meant by the term *sensitivity of the thermometer*.

....

....[1]

(b) (i) State which of the three suggested materials would give a thermometer of greatest sensitivity.

....

(ii) Explain your answer.

....

....

[2]

(c) (i) State which of the three materials would allow the thermometer to measure the largest range of temperature.

....

(ii) Explain your answer.

....

....

[2]

(d) The student found that the temperature scale of this thermometer was *non-linear*. Explain what this means.

....

....[2]

For Examiner's Use

3 Fig. 3.1 shows a person raising a concrete block from a river bed by using two pulleys.

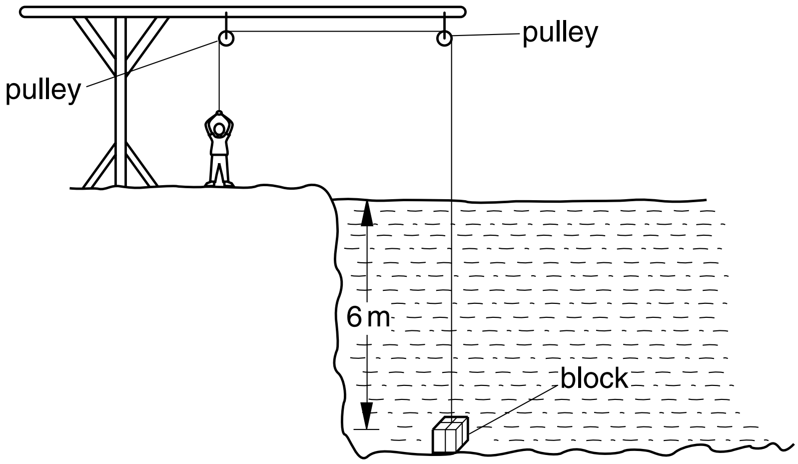

Fig. 3.1

(a) As shown in Fig. 3.1, the top of the block is 6.0 m below the water surface. The density of water is 1000 kg/m^3 and the acceleration of free fall is 10 m/s^2.

Calculate the water pressure acting on the top of the block.

pressure = ... [3]

(b) The block is raised through the water. At one point, the water pressure acting on the top of the block is 4.5 x 10^4 Pa. The area of the top of the block is 0.015 m^2. Calculate the downward force exerted by the water on the top of the block.

force =.. [2]

(c) When the block is clear of the water, it is raised a further 4.0 m. The weight of the block is 550 N. Calculate the work done on the block as it is raised the 4.0 m through the air.

work =.. [2]

(d) Some of the energy the person uses to raise the block is converted into heat energy. Indicate on the Fig. 3.1, using an arrow and the letter H, **two** places where heat is released. For each place, explain why heat is released there.

....

....

....

....[4]

For Examiner's Use

4 Fig. 4.1 shows water wavefronts which are approaching a small gap in a wall which divides two stretches of water of the same depth. The diagram is drawn to scale.

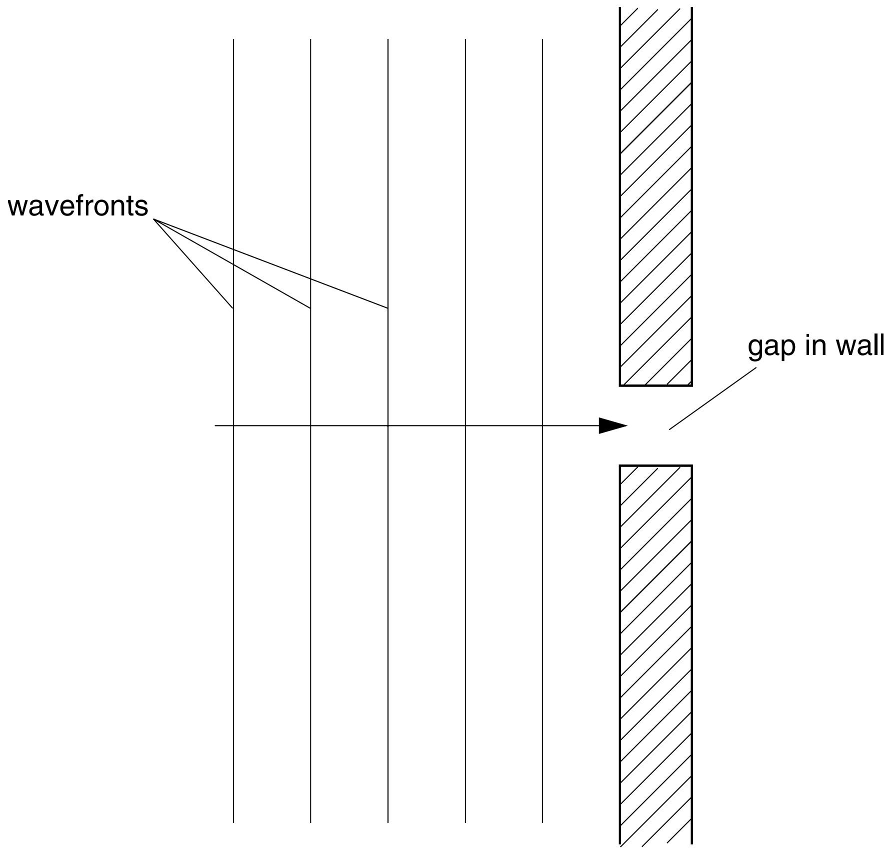

Fig. 4.1

(a) The waves moving towards the wall have a wavelength of 1.6 m and a frequency of 0.80 Hz.

Calculate the speed of these water waves.

speed of waves = ... [2]

(b) State the wavelength and frequency of the waves after they have passed through the gap in the wall.

wavelength = ...

frequency = ... [2]

(c) On Fig. 4.1, complete the pattern of wavefronts to the right of the wall. [3]

For Examiner's Use

5 **(a)** A student determines the specific heat capacity of water. It is found that 15.5 kJ of energy supplied raise the temperature of 0.45 kg of water by 8.2 °C.

Calculate the specific heat capacity of water.

specific heat capacity of water = ... [4]

(b) A cylinder, which is closed by a gas-tight moveable piston, contains 0.0060 m^3 of gas. The gas has its pressure raised from 2.0 x 10^5 Pa to 3.5 x 10^5 Pa, without any change in temperature.

(i) Describe how this could be achieved.

....

....

....

(ii) Calculate the volume when the pressure is 3.5 x 10^5 Pa.

volume = ...
[4]

For Examiner's Use

6 Fig. 6.1 shows an object placed 2.0 cm from a thin lens, which is to be used as a magnifying glass.

The focal length of the lens is 3.0 cm. The diagram is drawn to full scale.

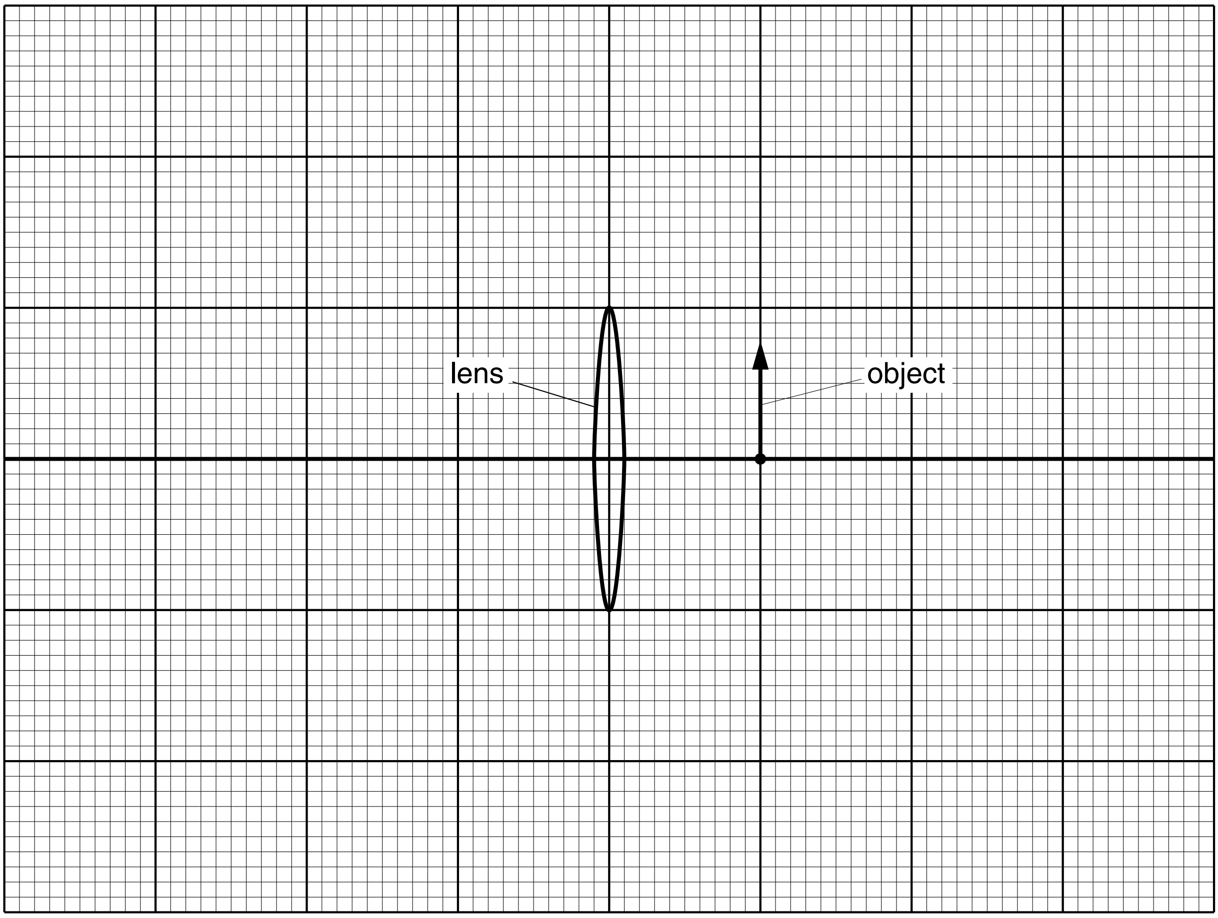

Fig. 6.1

(a) On Fig. 6.1, draw any two rays from the tip of the object which enable you to locate the tip of the image. Draw in the image and label it **I**. [3]

(b) On Fig. 6.1, draw in an eye position which would enable image **I** to be seen. [1]

(c) By taking measurements from Fig. 6.1, work out how many times bigger the image is than the object.

The image is .... times bigger than the object. [2]

For Examiner's Use

7 Fig. 7.1 shows how a student set up a circuit using three identical lamps. Assume that the resistance of each lamp does not change with the brightness of the lamp.

Each lamp is labelled 12 V, 2.0 A.

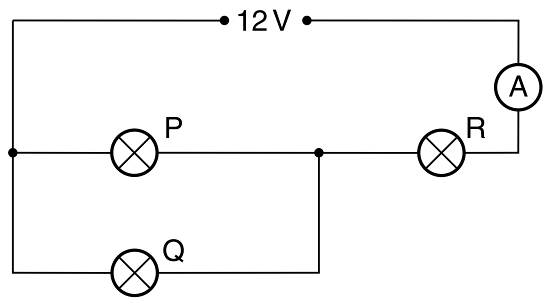

Fig. 7.1

(a) Calculate the resistance of one of the lamps.

resistance = ... [2]

(b) Calculate the combined resistance of the three lamps as connected in Fig. 7.1.

combined resistance = ... [2]

(c) Calculate the current which would be shown on the ammeter in Fig. 7.1.

current = ... [2]

(d) Explain why lamp R is less bright than normal and why lamps P and Q are both equally very dim.

....

....

....

....[3]

[Turn over

For Examiner's Use

(e) In the space below draw a circuit diagram which shows P, Q and R connected so that they will all work at normal brightness.

[1]

8 Fig. 8.1 shows a simple electrical generator. By turning the handle, the single coil may be spun between the poles of the magnet.

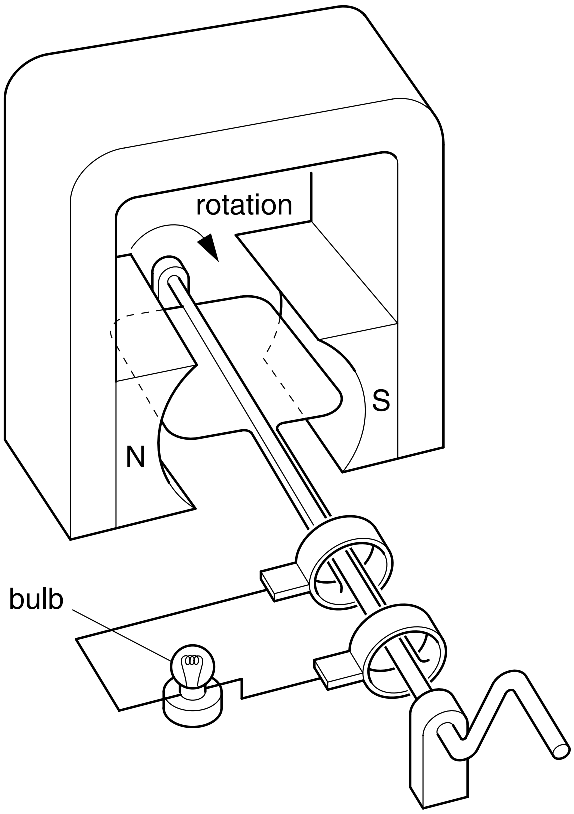

Fig. 8.1

(a) The handle is turned so that the coil makes two complete revolutions per second. The maximum output is 7 V. On Fig. 8.2, sketch this output over a period of 1 s.

[3]

Fig. 8.2

(b) Explain

(i) how an e.m.f. is induced,

....

....

....

....

(ii) why the e.m.f. varies in magnitude and direction.

....

....

....

....
[4]

For Examiner's Use

9 Fig. 9.1 shows an uncharged metal plate held in a wooden clamp and stand.

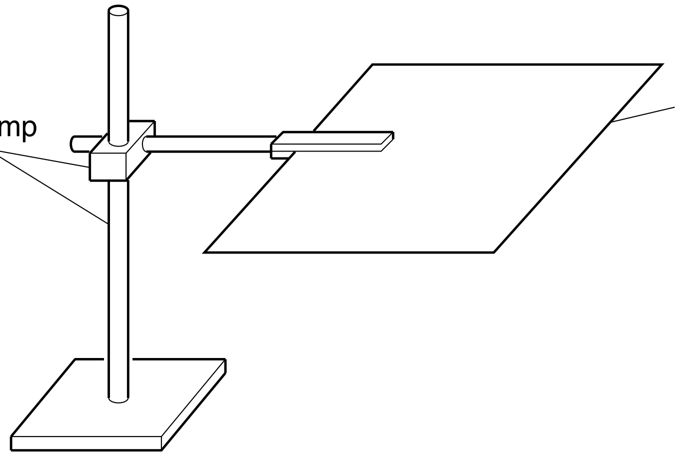

Fig. 9.1

(a) A polythene rod is charged negatively by rubbing it with a duster.

Suggest, in terms of the movement of electrons,

(i) how the polythene becomes negatively charged,

....

....

....

(ii) how the metal plate can be positively charged without the polythene touching the plate.

....

....

....

....

[4]

(b) A strong α-particle emitting source is brought close to, but not touching, the positively charged metal plate.

Explain why the plate rapidly loses its charge.

....

....

....

....[2]

For Examiner's Use

10 (a) A nuclide, symbol ${}^{A}_{Z}X$, decays by β-particle emission to a nuclide, symbol Y.
A β-particle has the symbol ${}^{0}_{-1}e$.

Write an equation for this decay.

[2]

(b) Fig. 10.1 shows how a β-particle source may be used to measure the thickness of paper as it is being produced.

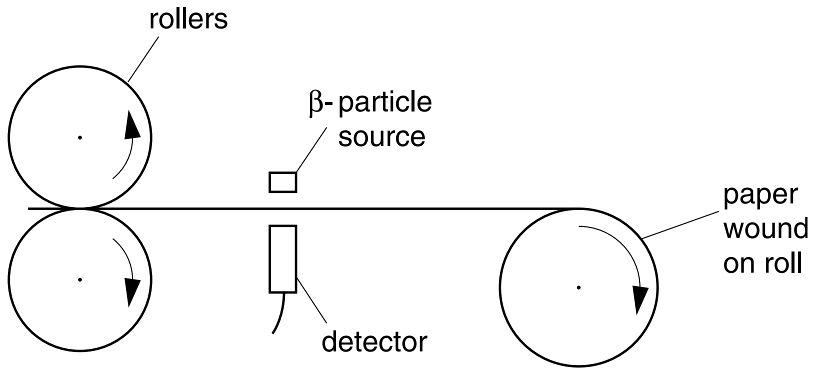

Fig. 10.1

(i) Explain why the reading of the detector changes with the thickness of the paper.

....

....

....

(ii) Write down two reasons why β-particles are more useful than γ-rays for this purpose.

reason 1. ....

....

....

reason 2. ....

....

....[4]

[Turn over

(c) Fig. 10.2 shows a beam of β-particles entering a magnetic field, the direction of which is into the paper.

Fig. 10.2

On Fig. 10.2 continue the path of the beam of β-particles as they pass through the magnetic field. [2]

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